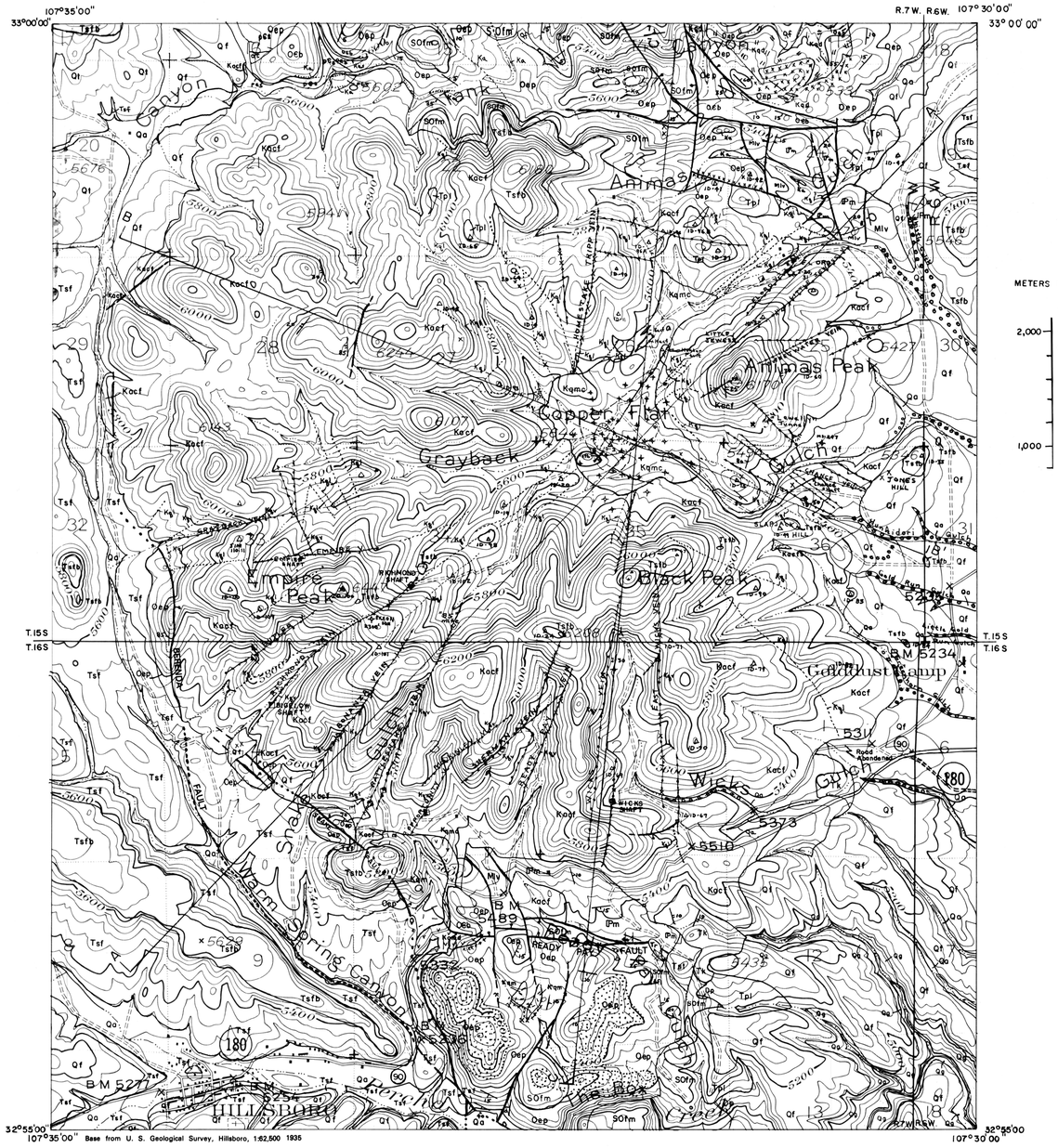
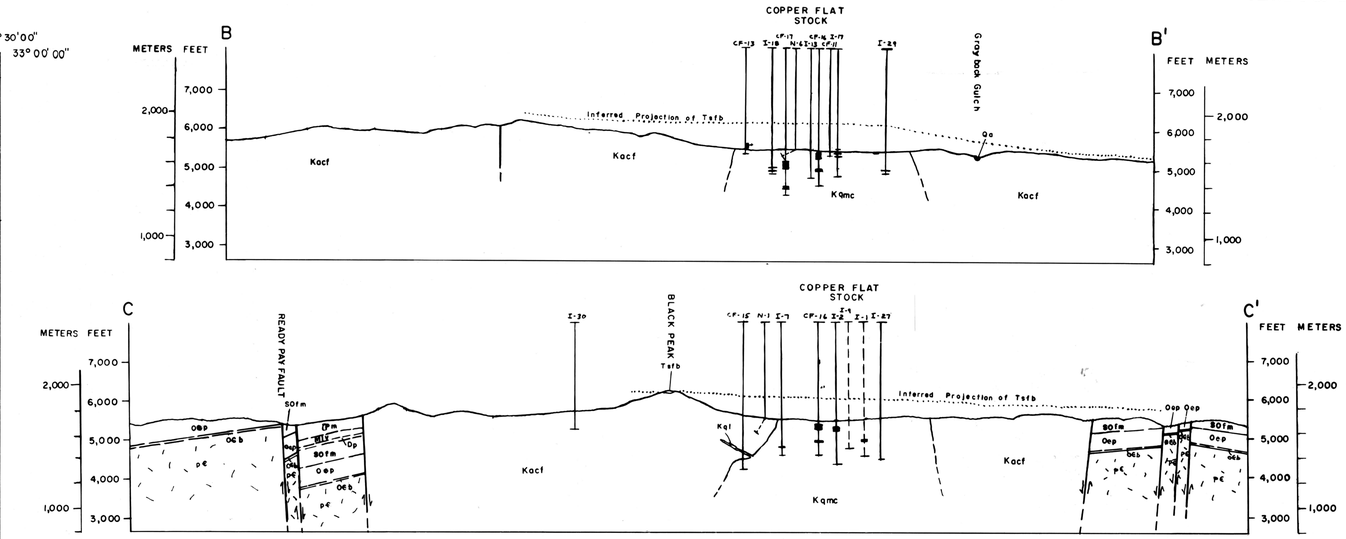


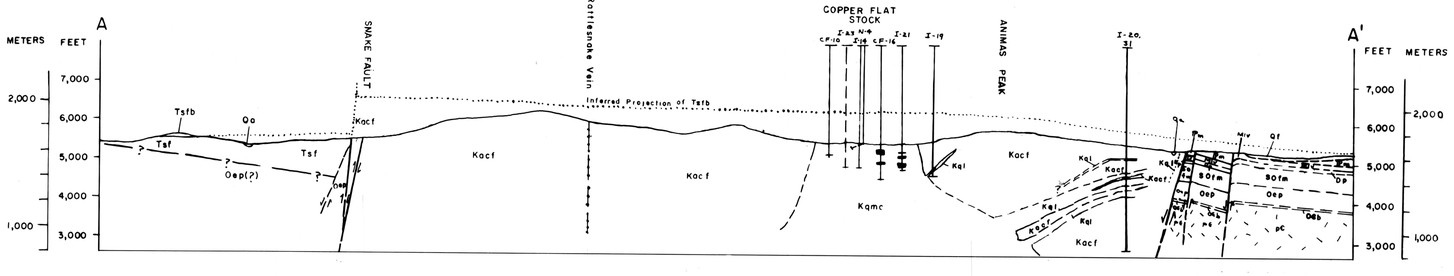
SCALE 1:24 000

1 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL FEET
DATUM IS MEAN SEA LEVEL





CORRELATION OF MAP UNITS

Qa	Holocene	QUATERNARY
Qf	Holocene and Pleistocene	
Qg, Qt	Pleistocene	
Tsfb	Pliocene	TERTIARY
Tsf	Pliocene and Miocene	
UNCONFORMITY		
Tpl, Tpll	Oligocene?	
Tk	Oligocene	
Tst	Oligocene	
UNCONFORMITY		
Kqmc, Kql, Kqmd, Kqm, Kqd	Upper Cretaceous	CRETACEOUS
Kacf, Kacfs	Upper Cretaceous	
Kas, Ka	Upper Cretaceous	
UNCONFORMITY		
IPm	Upper and Middle Pennsylvanian	PENNSYLVANIAN
Mlv	Lower Mississippian	MISSISSIPPIAN
Dp	Upper Devonian	DEVONIAN
SOfm	Middle Silurian and Upper and Middle Ordovician	SILURIAN-ORDOVICIAN
Oep	Lower Ordovician	ORDOVICIAN
Oeb	Lower Ordovician and Upper Cambrian	ORDOVICIAN-CAMBRIAN
UNCONFORMITY		
pGs		MIDDLE(?) PROTEROZOIC

Intrusive Rocks: Tr

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (HOLOCENE)--Poorly sorted gravel, sand, and silt deposits

Qf FAN DEPOSITS (HOLOCENE AND PLEISTOCENE)--Chiefly angular to subangular, poorly sorted fragments of volcanic rock

Qg PEDIMENT GRAVEL DEPOSITS (PLEISTOCENE)--Poorly sorted, unconsolidated cobbles, gravel, sand, and silt deposits largely derived from volcanic rocks. Locally well stratified. Commonly exposed along arroyos marginal to the Rio Grande depression

Qt TALUS (PLEISTOCENE)--Poorly sorted, unconsolidated, locally derived rock fragments

Tsfb ALKALI BASALT (PLIOCENE)--Bluish-gray, locally vesicular lava flows. Includes some feeder dikes that intrude the Copper Flat stock and the unconsolidated sediments of the Santa Fe Group. Whole rock K-Ar ages of 4.2 and 4.5± m.y. have been reported by Seager and others, 1984

Tsf SANTA FE GROUP (PLIOCENE AND MIOCENE)--Light-brown silt and coarsely stratified gravel, and a lower fanglomerate. Maximum thickness about 800 to 1,000 ft

Tr RHYOLITE PLUG (OLIGOCENE?)--Very light gray, aphyric, flow-laminated rhyolite intrusive along Ready Pay Gulch

Tpll QUARTZ LATITE (OLIGOCENE)--Pale-red to dusky-grayish-red flow-banded porphyritic lava flows of latitic composition. Gently dipping flow laminae suggest that outcrop is a remnant flow rather than an intrusive plug

Tpl POLLACK(?) QUARTZ LATITE OF JICHA, 1954 (OLIGOCENE)--Medium-gray, chiefly aphyric lava flow remnants that rest on the andesite of Copper Flat (Kacf). Correlation with Pollack Quartz Latite is uncertain

Tk KNEELING NUN TUFF (OLIGOCENE)--Pale-red, densely welded, devitrified crystal-rich ash-flow tuff. Strong compaction foliation imparted by alined biotite plates dips 10°-20° eastward

Tst SUGARLUMP TUFF (OLIGOCENE)--Pale-orange to pale-pinkish-brown, air-fall tuff and tuffaceous sandstone. Poorly compressed pumice lapilli and relatively abundant latitic lithic fragments up to 1 cm across

COPPER FLAT STOCK (UPPER CRETACEOUS)

Kqmc Quartz monzonite--Light-pinkish-gray to light-gray, hypidiomorphic-granular to porphyritic to fine-grained pegmatitic texture. Contains euhedral orthoclase laths as long as 2.3 cm (50-70 percent), subhedral oligoclase (An_{23-28}) as grains less than 5 mm across (12-15 percent), quartz (6-13 percent), biotite (0.5-6.5 percent), and highly variable amounts of pale-green hornblende. Accessory minerals in the nonmineralized parts of the stock are magnetite, sphene, zircon, apatite, epidote, and calcite. A biotite concentrate has yielded a K-Ar age of 75.1±2.5 m.y. (R. F. Marvin, H. H. Mehnert, and Violet Merritt, U.S. Geological Survey, written commun., 1974)

Kql Quartz latite dikes--Light-gray to light-pinkish-brown porphyry containing 18-35 percent phenocrysts of oligoclase (An_{24-30}), sanidine, and quartz in a matrix of alkali feldspar microlites. Some sanidine phenocrysts are as much as 1.5 cm long and display Carlsbad twinning; others have marginal overgrowths of secondary alkali feldspar and display highly resorbed and pitted cores. Accessory minerals are sphene, iron oxides, epidote, calcite, sericite, and chlorite. Locally the dikes are reddened, brecciated, and mineralized with pyrite, chalcopyrite, and trace amounts of gold

WARM SPRINGS CANYON STOCK (UPPER CRETACEOUS)

Kqmd Quartz monzodiorite--Light-gray hypidiomorphic-granular, medium-grained rock containing orthoclase (1-15 percent), sodic andesine (An_{30-32}) (54-76 percent), quartz (9-13 percent, hornblende (6-12 percent), biotite (2-3 percent), and accessory chlorite, ferric oxides, white mica, and apatite. Crops out as marginal facies of the adamellite of Warm Spring Canyon (Kqm)

Kqm Adamellite--Light-pinkish-gray hypidiomorphic-granular to xenomorphic-granular medium-grained rock containing orthoclase (28 percent), oligoclase (An_{25-28}) (43 percent), quartz (22 percent), biotite (2 percent), hornblende (2 percent), epidote (2 percent), and accessory sphene, ferric oxides, and apatite. Two small plugs of adamellite also crop out 1/4 mi southeast of the larger pluton but show a greater degree of alteration with strong sericitization of the feldspars

Kqd QUARTZ DIORITE OF TANK CANYON (UPPER CRETACEOUS)--Medium-gray, panidiomorphic-granular, medium-grained rock containing orthoclase (0.2 percent), sodic andesine (An_{30-34}) (65 percent), quartz (10-12 percent), hornblende (13-17 percent), biotite (0.5 percent), and iron oxides (4 percent). Accessories are chlorite, epidote, sphene, and apatite

Kacf ANDESITIC ROCKS OF COPPER FLAT (UPPER CRETACEOUS)--Remnant cone of the Copper Flat volcano. Flows consist of dark-gray, medium-gray, and greenish-gray aphyric to porphyritic andesite and andesite breccia lava flows. Flows are of considerable thickness, probably at least 3,280 ft (1,000 m) as based on drill holes IDC-20,31 and on an EXXON drill hole southeast of Empire Peak. Locally includes a white to very light gray sandstone member (Kacfs) that is intercalated with the andesite

Kas ANDESITE SILLS (UPPER CRETACEOUS)--Olive-gray to medium-gray andesite that commonly weathers to a spheroidal structure. Along Tank Canyon sill follows bedding surfaces within the Bliss Sandstone (Oeb) and has a maximum thickness of about 75 ft (23 m). Other sills occur along Animas Gulch

Ka ANDESITE DIKES (UPPER CRETACEOUS)--Olive-gray to medium-gray intrusives that weather to a dark yellowish brown. Dikes follow fracture and joint surfaces in Paleozoic strata along the north margin of the Copper Flat volcano. Thicknesses commonly less than 50 ft (15 m)

IPm MAGDALENA GROUP UNDIVIDED (UPPER AND MIDDLE PENNSYLVANIAN)--Limestone, minor shale and very minor chert- and limestone-pebble conglomerate. Limestone is medium gray, medium to thick bedded; commonly silty, laminated, brown-weathering limestone or calcisiltite beds in the middle and upper parts of the section. Limestones are highly fossiliferous and indicate both a Des Moinesian and Virgilian age. Average thickness about 720 ft (220 m)

Mlv LAKE VALLEY LIMESTONE (LOWER MISSISSIPPIAN)--Chiefly limestone and marl. Commonly can be divided into four members: Tierra Blanca, Nunn, Alamogordo, and Andrecito. Total thickness about 200 ft

Dp PERCHA SHALE (UPPER DEVONIAN)--Black fissile shale of the Box Member overlies silty shale with limestone nodules of the Ready Pay Member. Small, poorly exposed outcrop along Ready Pay Gulch. Elsewhere thickness is about 160 ft within the Hillsboro quadrangle

SOfm FUSSELMAN DOLOMITE (MIDDLE SILURIAN) AND MONTOYA GROUP (UPPER AND MIDDLE ORDOVICIAN)
Fusselman Dolomite--Medium-gray to light-olive-gray, poorly fossiliferous dolomite. Siliceous upper unit commonly weathers brown. Thickness ranges from 85 to 140 ft
Montoya Group--Chiefly dolomitic strata that can be divided into three formations: Cutter Dolomite, Aleman Formation, and Second Value Dolomite. Total aggregate thickness 310-400 ft

Oep EL PASO LIMESTONE (LOWER ORDOVICIAN)--Chiefly medium-dark-gray, poorly fossiliferous limestone, locally contains calcisiltite laminae that weather light brown. Limestone is locally pelletal and commonly contains a cherty unit 20-75 ft (6-23 m) below the lowest dolomite bed of the Montoya Group. Fossils include Piloceras sp. and Macularites sp. Thickness about 515 ft

Oeb BLISS SANDSTONE (LOWER ORDOVICIAN AND UPPER CAMBRIAN)--Light-brown, dark-greenish-gray, and olive-gray, well indurated sandstone and quartzite. Locally has hematitic cement near the base of the unit and glauconitic beds at the top. Just west of BM 5489 the thin beds of quartzitic sandstone are interlayered with thin limestone beds and laminae. Thickness 110-130 ft

pGs QUARTZOFELDSPATHIC GNEISS OF TANK CANYON (MIDDLE? PROTEROZOIC)--Pale-brownish-gray, fine- to medium-grained gneiss with thin layers of hornblende schist that strike N.-N. 5° E. parallel to the foliation

SYMBOLS

- CONTACT
- FAULT--Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side
- STRIKE AND DIP OF INCLINED BEDS
- STRIKE AND DIP OF COMPACTION FOLIATION IN TUFFS AND FLOW LAYEKING IN LAVAS
- DIKE
- VEIN
- TACTITE ZONES
- AREAS OF JASPEROIDS
- PLACER DEPOSITS
- SAMPLE LOCALITY FOR POTASSIUM-ARGON AGE DETERMINATION
- PROSPECT PIT
- ADIT WITH WASTE
- SHAFT
- DRILL HOLE SITE
- DRILL HOLE IN CROSS SECTION--Dashed where projected
- TRIANGULATION STATION

GEOLOGIC MAP OF THE COPPER FLAT STOCK AND VICINITY, HILLSBORO DISTRICT, SIERRA COUNTY, NEW MEXICO

By

D. C. Hedlund

1985

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.